When the brain speaks for itself : exploiting hemodynamic brain signals for motor-independent communication

Stellingen behorende bij het proefschrift

When the brain speaks for itself

Exploiting hemodynamic brain signals for motor-independent communication

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1. Humans are remarkably able to voluntarily modulate various properties of their hemodynamic brain signals – even without extensive pretraining. *(this thesis)*
2. Providing someone with information about the current activation level within a particular brain region ('neurofeedback') can improve his/her ability to differentially modulate the amplitude of hemodynamic brain signals. *(this thesis)*
3. Onset, duration and source location of hemodynamic brain signals can be derived from functional MRI responses evoked by single cognitive episodes. *(this thesis)*
4. The human capability to purposefully generate hemodynamic brain signals with different spatiotemporal properties can be instrumentalized for neurally encoding a variety of distinct information units, *e.g.*, letters. This might allow severely paralyzed (*e.g.*, 'locked-in') patients to motor-independently communicate basic thoughts and needs letter-by-letter. *(this thesis)*
5. Neurally encoded messages can be decoded on-line enabling back-and-forth communication during an ongoing functional MRI session. *(this thesis)*
6. "The human being lives according to its communication capacity: loosing the capacity for communication means loosing life." (*Ludwig Hohl, 1904-1980*).
7. "One cannot not communicate." *(Paul Watzlawick, 1921-2007).* Unfortunately, 'locked-in' patients can – when not provided with alternative communication means.
8. "Thoughts are free." Even sophisticated functional neuroimaging methods cannot change that.
9. In only a few decades or even years, people will smile at the research method used in this PhD project (functional MRI) and say: "Imagine, they put students inside a huge magnet that was not portable and extremely expensive. Inside the machine, one had to lie completely still and was exposed to incredible noise. And what they measured was not even neural activity but only its vascular response."
10. Should one bother to re-analyze functional MRI data from bygone days with the contemporary data analysis methods, one may obtain astonishing results. In some cases this should even result in the verification of the original hypotheses.
11. I can only imagine what it means to be in a 'locked-in' state. But I certainly know how it feels when my car is trapped in the UNS40 parking garage Friday night 10.29 p.m.

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